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FARMER'S AWARENESS ON THE EFFECT OF CLIMATE CHANGE IN RAINFED COTTON CULTIVATION IN THOOTHUKUDI DISTRICT OF TAMILNADU

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ABSTRACT

Climate change is attributed directly or indirectly to human activity that alters the composition of the global atmosphere. Agriculture is inherently sensitive to climatic changes and is one of the most vulnerable sectors. The study was undertaken to find out the farmer's awareness on the effect of climate change in rainfed cotton cultivation. Thoothukudi district of Tamil Nadu, which received an annual rainfall of 656 mm has recorded the maximum area under rainfed cotton cultivation in the Southern Dry Zone of Tamil Nadu. The awareness on the effect of climate change deals with the factors namely rainfall, relative humidity, sunshine, temperature and wind velocity is highly important for crop improvement in agriculture. The extension workers have to conduct demonstration and training more to mobilize farmers and extension service providers in order to contribute towards mitigating adverse effect of climate change on agriculture productivity.

KEYWORDS: Climate Change, Cotton & Awareness Adverse Effect and Farmers

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INTRODUCTION

The United Nations Framework Convention on Climate Change (UNFCCC) defined "Climate change" as a change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere. Agriculture is inherently sensitive to climatic changes and is one of the most vulnerable sectors (Parry *et al.*, 2005).

During the past century, the atmospheric temperature had increased by 0.74^0C due to unscrupulous anthropogenic greenhouse gas emissions. This trend is going to aggravate by the year 2100, with a probable average global temperature rise of 1.8^0C to 4.0^0C and a possible maximum rise of up to 6.4^0C (IPPC, 2007). The consequence of global warming has already manifested in the form of frequent occurrence of warm and drought years, decline in glaciers and snow cover, heavy precipitation and flash floods, sea level rise, etc. It is very likely that such extreme events will continue to become more frequent, posing potential threat to ecosystems especially agricultural production and productivity throughout the world. Adding to the misery, non-climatic stresses such as population, poverty, unequal access to resources, etc. are increasing the vulnerability of the system by reducing its adaptive capacity (IPPC, 2007). The effect of such an unprecedented climate change would be particularly severe in the tropical areas, which mainly consists of developing countries, including India (Rao *et al.*, 2010). Many studies have analyzed the changing trend of temperature and rainfall over different regions of India and examined its effects

on growth, development and yield of different crops (Aggarwal, 2009). Most of the studies projected that the decreased yield in rainfed and dry land wheat and rice and loss in farm net revenue between 9 to 25 per cent for a temperature increase of 2 to 3.5^0C. Sinha and Swaminathan (1991) showed that an increase of 2 degree Celsius in temperature could decrease rice yield by about 0.75 tons/ha in the high yield areas; and a 0.5 degree Celsius increase in winter temperature would reduce wheat yield by 0.45 ton/ha. Saseendran et al. (2000) showed that for every one degree rise in temperature the decline in rice yield would be about 6 per cent. Major impacts of climate change will likely be on rain-fed crops (other than rice), which account for nearly 60 per cent of crop land area. In India, poorest farmers often practice rain-fed agriculture. For the temperature rise of 2^0C in mean temperature and a 7 per cent increase in the mean precipitation would create a 12 per cent reduction in net revenues for the country as a whole (Dinar et al., 1998). Keeping this in view the present research study was undertaken to find out farmer's awareness on effect of climate change in rain-fed cotton cultivation.

SCENARIO OF RAIN-FED AGRICULTURE

Rainfed agriculture is an important economic activity in the developing world. Globally, rainfed agriculture is practiced in 80 per cent of the total physical agricultural area and generated 62 per cent of the world's staple food (Bhattacharya, 2008). Rainfed agriculture is largely practiced in arid, semi-arid and sub humid regions in the country. With about 68 per cent of rural population (Kumar et al., 2009), these regions are also home to 81 per cent of rural poor (Rao et al., 2005). In rainfed regions, the annual precipitation is lower than the evapo-transpiration demand particularly in arid and dry semi-arid zones. Rainfed agriculture is considered as a gamble with monsoon while soils in these regions are not only thirsty but also hungry. Rainfed agricultural scenario is influenced by both bio-physical and socio-economic factors and their interaction. India ranks first among the rainfed agricultural countries of the world in terms of both extent and value of produce. Rainfed agriculture is practiced in two-thirds of the total cropped area of 162 million hectares (66%). Rainfed agriculture supports 40 per cent of the national food basket. The importance of rainfed agriculture is obvious from the fact that 55 per cent of rice, 91 per cent coarse grains, 90 per cent pulses, 85 per cent oilseeds and 65 per cent cotton are grown in rainfed areas (CRIDA, 2007). These areas receive an annual rainfall between 400 mm to 1000 mm, which is unevenly distributed, highly uncertain and erratic. In certain areas, the total annual rainfall do not exceed 500 mm. As a result of low and erratic rainfall, a significant fall in food production is often noticed. Within agriculture, it is the rainfed agriculture that will be most impacted by climate change. Temperature is an important weather parameter that will affect productivity of rainfed crops. The last three decades recorded a sharp rise in all India mean annual temperature. Though most rainfed crops tolerate high temperatures, rainfed crops grown during rabi are vulnerable to changes in minimum temperatures (Venkateswarlu and Rama Rao, 2010). As far as Karnataka state is concerned 82 per cent of the net sown area was under rainfed condition during 2009-10.

MATERIALS AND METHODOLOGY

Thoothukudi District of Southern Dry Zone of Tamil Nadu, which received an annual rainfall of 656 mm, was purposively selected to assess the effect of climate change, where the rainfed farmers were highly vulnerable to various climatic factors. Thoothukudi district has recorded the maximum area under rainfed cotton cultivation in Southern Dry Zone of Tamil Nadu. Thoothukudi district consists of twelve blocks. For the selected crop top two blocks were selected based on the existence of maximum area under rainfed cotton cultivation. In each block, two villages having maximum area under rainfed cotton were identified. The respondents of 60 rainfed cotton growers were selected in these villages based on the proportionate random sampling method. The sample respondents drawn from each villages is presented in

Table 1.

Table 1: Distribution of Respondents

S. No	Crop	Name of Village	Number of Rainfed Cotton Growers	Proportionate Sample Size Selected
1.	Cotton	**Kovil Patty Block**		
		Orulaikudi	365	18
		Idaiseval	210	10
		Kayathar Block		
		Kazhukumalai	310	15
		Venkadeshvarapuram	340	17
		Total	**1225**	**60**

(**Source:** Assistant Director of Agriculture office, Kovilpatty and Kayathar blocks 2017-2018)

RESULTS AND DISCUSSIONS

An attempt was made to analyze the awareness level of the respondents with respect to effect of each climatic components such asrainfall, relative humidity, sunshine, temperature and wind velocity on the cotton cultivation. Percentage analysis was performed and the findings are given in the Table 2.

Table 2: Awareness of Cotton Growers on Effect of Climate Change

(N=60)

S. No	Effect of Climate Change	Number	Per cent
A.	**Rainfall**		
1.	Excess rainfall at sowing affects germination	53	88.33
2.	Excess rainfall leads to seedling death	53	88.33
3.	Excess rainfall leads to flower shedding	56	93.33
4.	Excess rainfall leads to young boll shedding	52	86.66
5.	High rainfall during harvest reduces quality of lint	53	88.33
6.	Rainfall at boll setting stage reduces the number of bolls	18	30.00
7.	Continuous rainfall favours pest and disease incidence	23	38.33
B.	**Relative Humidity**		
8.	High relative humidity favours pest and disease incidence	39	65.00
9.	High relative humidity leads to boll shedding	35	58.33
C.	**Temperature**		
10.	Decrease in temperature cause slowgermination	26	43.33
11.	Decreases in temperature leads to root death	7	11.66
12.	Number of leaves reduced due to decrease in temperature	16	26.66
13.	Plant height reduced due to decrease in temperature	7	11.66
14.	Increase in temperature causes fruit shedding	59	98.33
15.	Increase in temperature reduces lint quality	12	20.00
16.	Increase in temperature depletes soil moisture	56	93.33
17.	Increase in temperature cause fruit drop leads to high vegetative growth	33	55.00
18.	Increase in temperature leads to high micronaire	8	13.33
19.	Severe frost cause death of entire plant	56	93.33
20.	Increase in temperature reduce the viability of pollen	1	1.66
21.	Decrease in temperature cause delay in flowering	36	60.00
22.	Decrease in temperature increase sucking pest incidence	7	11.66
23.	Decrease in temperature increases disease incidence	5	8.33
24.	Increase in temperature during night reduces seed number per boll	6	10.00
D.	**Sunshine**		
25.	Abundant sunshine during boll formation for good quality	54	90.00
26.	Short day condition trigger profuse flowering	48	80.00
E.	**Wind Velocity**		
27.	Hot wind increases crop water requirement	52	86.66

Table 2: Contd.,			
28.	High wind velocity during flowering stage affect pollination	14	23.33
29.	High wind velocity during maturity cause loss of lint	58	96.66
30.	High wind velocity enhances spread of diseases	24	40.00

Rainfall

Most of the respondents (93.33%) had awareness on excess rainfall leads to flower shedding. More than four-fifth of the respondents (88.33%) had awareness on excess rainfall at sowing would affect the germination and leads to seedling death and also reduces the quality of lint. More than four-fifth of the respondents (86.66%) had awareness on excess rainfall would enhance the young boll shedding. About one-third of the respondents (38.33%) had awareness on continuous rainfall that might favour pest and disease incidence followed by 30.00 per cent of the respondents were aware that rainfall during boll setting stage would result in reduced the number of bolls.

Relative Humidity

More than three-fifth of the respondents (65.00%) had awareness on high relative humidity that might favour pest and disease incidence. More than half of the respondents (58.33%) were aware that high relative humidity would result in boll shedding.

Temperature

Most of the respondents (98.33%) had awareness regarding the fact that increase in temperature would cause fruit shedding followed by 93.33 per cent of the respondents had awareness on increase in temperature would deplete soil moisture and severe frost would result in death of entire plant. Exactly three-fifth of the respondents (60.00%) had awareness on decrease in temperature would might cause delay in flowering followed by more than half of the respondents (55.00%) had awareness on increase in temperature that would cause fruit drop and leads to high vegetative growth. More than two-fifth of the respondents (43.33%) had awareness on decrease in temperature that would cause slow germination. More than one-fourth of the respondents (26.66%) had awareness on decrease in temperature that would result in reduced number of leaves followed by exactly one-fifth of the respondents (20.00%) had awareness on increase in temperature which would reduce the yield of lint. About 13.33 per cent of the respondents had awareness on increase in temperature that would lead to high micronaire followed by 11.66 per cent of the respondents were aware that a decrease in temperature would result in root death, plant height reduced and increase sucking pest incidence. About one-tenth of the respondents had awareness on the fact that an increase in temperature during night would reduce seed number per boll followed by 8.33 per cent of the respondents were aware that a decrease in temperature would enhance disease incidence. Only one respondent (1.66%) had awareness that an increase in temperature would affect the viability of pollen.

Sunshine

Majority (90.00%) of the respondents had awareness on the issues relating to sunshine i.e. abundant sunshine during boll formation would enhance good quality of lint followed by exactly four-fifth of the respondents (80.00%)were aware about the fact that short day conditions would trigger profuse flowering.

Wind Velocity

Most of the respondents (96.66%) had awareness regarding the fact that high wind velocity during maturity stage would cause the loss of lint. Majority (86.66%) of the respondents had awareness on increase in hot wind would increase

the crop water requirement. Exactly two-fifth (40.00%) of the respondents had awareness that high wind velocity would enhance the spread of diseases followed by nearly one-fourth of the respondents (23.33%) had awareness about the fact that high wind velocity during flowering stage would affect pollination and would increase flower dropping.

Table 3: Overall Awareness of Rainfed Cotton Growers on Effect of Climate Change in Rainfed Cotton Cultivation

S. No.	Overall Awareness	Number	Percent
1.	Low	11	18.33
2.	Medium	37	61.66
3.	High	12	20.00
Total		**60**	**100**

Table 3 reveals that just more than three-fifth of the respondents (61.66%) possessed medium level of awareness on effect of climate change followed by exactly one-fifth (20.00%) of the respondents had high level of awareness on the effect of climate change. The remaining (18.33%) of the respondents had low level of awareness on the effect of climate change on rainfed cotton cultivation.

These findings are also supported by Sivaraj*et al.,* 2014 which revealed that paddy farmers had medium level of awareness (41.50%) on climate change followed very closely by high level of awareness (39.00%).

CONCLUSIONS

Climate change has emerged as the primary determinant ofagricultural productivity. Climate changes and extreme weather events strongly influence agriculture which in turn will threaten national food security. The degree, frequency, and nature of climatic changes can have serious consequences for agriculture and farming practices. Hence, farmers' awareness about climate change, its causes, impact and indicators are of critical importance thereby helping them in coping-up with negative impact of climate change on agriculture productivity. The present study has highlighted thatawareness on effect of climate change is highly important for crop improvement in agriculture. A majority of the cotton farmers (81.66%) fall under medium to high level of awareness on the effect of climate change in rainfed cotton cultivation. The extension workers have to conduct demonstrations and training programmes on the effect of climate change and its remedies to the young, educated, small and medium cotton farmers and mobilize extension services providers to contribute in mitigating adverse effect of climate change on agriculture productivity.

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